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Director of Logistics

8 MAY 1958

Director of Communications

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[redacted] 25X1

1. The Office of Communications has a requirement for the development of broadband ELINT antennas, filters and video detectors in the [redacted] 25X1
[redacted] has submitted a proposal for design investigation 25X1
and prototype construction of these antennas in a program of two or more phases.

2. The technical proposal and estimated cost breakdown have been evaluated and are considered satisfactory. [redacted] 25X1
[redacted] appears to have the qualified personnel, experience, and 25X1
laboratory facilities necessary to perform this work. This Office desires to undertake Phase I of this Program, and to delay action on the later phases until the feasibility of the equipment is demonstrated.

3. It is requested that contractual action be initiated with the [redacted] in accordance with the attached documents 25X1
describing Phase I of the design and development work. Attached is Requisition No. MSB 58-465 dated April 1958 indicating that the allotment to be charged for this work is 8-7912-50-600. Funds in the amount of $25,259.36 have been encumbered for this project. The association of the Agency with the contract and the equipment is classified SECRET, although the actual equipment and engineering reports are UNCLASSIFIED. The project engineer for this work is [redacted] 25X1

SIGNED

[redacted] 25X1

Attachments:
Requisition No. MSB 58-465
Estimated Cost Analysis Enclosure A
Contractor's letter dated 28 March 1958
Contractor's letter dated 24 March 1958
Contractor's proposal report CEP-1073

Coordination:

R+D	OC-E
OC-A	SPD
OC-P	DD/CO

OC-E/R+D-EP/LHG:mjr (1 May1 58)
cc: R+D Subject File
OC-A
[redacted]
MSB
SPD
R+D Obligation File
R+D Vital File
OC-E Chrono
R+D Chrono
EP Chrono

25X1

SECRET

Report No. CEP-1073
Copy No. 3
Bid Request No. 5303

PROPOSAL FOR

BROADBAND ANTENNA FILTER AND DETECTOR SYSTEMS

28 March 1958

Prepared For

THE U.S. GOVERNMENT

STAT

A PUBLICATION OF

THE RESEARCH AND DEVELOPMENT LABORATORIES

Department 12

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Proposal For

BROADBAND ANTENNA AND DETECTOR SYSTEMS

This proposed program is for research and development which will result in broadband antennas, filters, and detectors for various parts of the frequency range of 50 to 40,000 mc. Sixteen different antennas with bandwidths ranging from 2 to 1 to 20 to 1 and with gains better than a dipole if possible are required. Ten different bandpass filters and a variety of crystal video detectors to work with these antennas are also required. The work will be performed in three phases. Phase I will include a study phase wherein the basic problems will be studied and investigated experimentally. Phase II will consist of the development of engineering models of the various antennas, filters, and detectors. Phase III will be the final development of the prototype models and the preparation of a bill of materials and specifications. Production of the antennas would be performed after the completion of Phase III.

There are many problems which must be investigated in Phase I before proceeding to Phase II and the construction and testing of engineering models. For the antenna part of the study phase, it is proposed that logarithmically periodic structures and electromagnetic horns be examined beyond the point of normal usage to include wide band operation.

Logarithmically periodic antennas have not been tested to any great extent at frequencies above 5 kmc. Due to the periodicity of the antenna, the bandwidth is theoretically unlimited, but physical limitations do not permit this type of operation. Problems such as modeling techniques, fabrication methods, and methods of feed all tend to put limitations on the upper frequency limit of the antenna. An increase in the upper frequency limit of the periodic structure is expected up to 10 or 15 kmc. Beyond that frequency, a horn will have to be used. The lower limit is restrained by the given size of the antenna. Artificial loading of the structure will be investigated in an effort to extend the lower frequency limit for a given size antenna.

Experimental results of the periodic structures have shown the potentiality of being used over very wide frequency ranges. Bandwidths up to 15:1 have been examined with very favorable results. Impedance and pattern characteristics are essentially constant over wide frequency ranges.

It is felt that a reduction in the number of antennas can be attained with the use of these periodic structures. One periodic structure can be used in conjunction with two filters, therefore minimizing the number of units.

Figures 1 and 2 show possible means of mounting some of the antennas to the box of specified dimensions. The exact location will be determined after experimental tests can be conducted. With the exception of the three antennas whose lower frequency limit is 50 mc, the sizes allotted for the antennas should be adequate. The operation of these three antennas to be placed in an area 24 x 36 inches will be restricted to approximately 100 mc. If 50-mc operation is desired, the maximum size will have to be increased to accommodate the extended range.

The last problem in conjunction with the antenna part is the use of horns and waveguide feed at the high frequencies in question. Ridged waveguide and broadband horns will be investigated to see whether it is feasible to operate them over 4 to 1 and 5 to 1 frequency ranges and still produce the required characteristics.

Problems which will merit attention in the filters are not as numerous as the antennas but still require experimental investigation. The response of the filters will have to be checked several octaves above the upper cutoff frequency to insure that the filter is still behaving as a single bandpass filter. Both printed circuit and waveguide type filters will be investigated. The transitions from strip line to antenna and possibly from strip line to detector cables will also merit investigation.

A few problems are also anticipated in regard to detectors and associated equipment. Various types of crystals for the different frequency ranges will be examined along with holders and mounts. The exceptionally broadband requirements set forth will require considerable investigation of holders or mounts for the crystals.

The crystal and filter portion of the study phase will be conducted by the [redacted] STAT

[redacted] STAT This division has had experience in the design and development of similar components for ECM contracts.

At the completion of Phase I, upon mutual agreement of sponsor and contractor, the work to be performed in Phase II will be decided.